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<b>(21) International Application Number:</b> PCT/US97/11678 <b>(22) International Filing Date:</b> 2 July 1997 (02.07.97)  <b>(30) Priority Data:</b> 9613899.5                      3 July 1996 (03.07.96)                      GB  <b>(71) Applicant (for all designated States except US):</b> THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> BROOKS, Alan [GB/GB]; 17 Crown Meadow, Colnbrook, Slough SL3 0LJ (GB). DU REAU, Charles, Marie, Alain [FR/GB]; 73 Park Road, London W4 3EY (GB). ELLIOTT, Russell, Philip [GB/GB]; 24 Nobles Way, Egham, Surrey TW20 9RJ (GB).  <b>(74) Agents:</b> REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).		<b>(81) Designated States:</b> CN, MX, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> CLEANSING COMPOSITIONS  <b>(57) Abstract</b>  A personal cleansing composition comprising: (a) an alkyl ethoxy carboxylate surfactant of formula (I): $R^3O(CH_2CH_2O)_kCH_2COO^-M^+$ wherein $R^3$ is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation $M^+$ ; (b) a short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain; (c) a water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof; and (d) optionally, a cationic polymeric skin conditioning agent; wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15 % by weight of unethoxylated and singly ethoxylated surfactant (k = 0 and 1), and wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate is in the range of from about 6:1 to about 1:6. The products demonstrate excellent in-use efficacy benefits including mildness, a moisturised skin feel, excellent rinsability and good product stability and lather attributes.		

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## CLEANSING COMPOSITIONS

### TECHNICAL FIELD

The present invention relates to cleansing compositions. In particular it relates to mild personal cleansing compositions with good skin feel attributes, rinsing behaviour and foaming properties which are suitable for simultaneously cleansing and conditioning the skin and/or the hair and which may be used, for example, in the form of foam bath preparations, shower products, skin cleansers, hand, face and body cleansers, shampoos, etc.

### Background Of The Invention

Mild cosmetic compositions must satisfy a number of criteria including cleansing power, foaming properties and mildness/low irritancy/good feel with respect to the skin, hair and the ocular mucosae. Skin is made up of several layers of cells which coat and protect the keratin and collagen fibrous proteins that form the skeleton of its structure. The outermost of these layers, referred to as the stratum corneum, is known to be composed of 250 Å protein bundles surrounded by 80 Å thick layers. Hair similarly has a protective outer coating enclosing the hair fibre which is called the cuticle. Anionic surfactants can penetrate the stratum corneum membrane and the cuticle and, by delipidization, destroy membrane integrity. This interference with skin and hair protective membranes can lead to a rough skin feel and eye irritation and may eventually permit the surfactant to interact with the keratin and hair proteins creating irritation and loss of barrier and water retention functions.

Ideal cosmetic cleansers should cleanse the skin or hair gently, without defatting and/or drying the hair and skin and without irritating the ocular mucosae or leaving skin taut after frequent use. Most lathering soaps, shower and bath products, shampoos and bars fail in this respect.

Certain synthetic surfactants are known to be mild. However, a major drawback of most mild synthetic surfactant systems when formulated for shampooing or personal cleansing is poor lather performance compared to the highest shampoo and bar soap standards. Thus, surfactants that are among the mildest are marginal in lather. The use of known high sudsing anionic surfactants such as alkyl sulphates with lather boosters, on the other hand, can yield acceptable lather volume and quality but at the expense of clinical skin mildness. These two facts make the selection of suitable surfactants in the lather and mildness benefit formulation process a delicate balancing act.

Thus a need exists for personal cleansing products which deliver acceptable in-use skin feel characteristics but which will not dehydrate the skin, damage the skins barrier function or result in loss of skin suppleness, which will provide a level of skin conditioning performance in a wash and rinse-off product which previously has only been provided by a separate post-cleansing cosmetic moisturizer, which demonstrate desirable rinsing behaviour and which will produce a foam which is stable and of high quality, which are effective hair and skin cleansers, which have good rinsibility characteristics, and which at the same time have stable product and viscosity characteristics and remain fully stable under long term and stressed temperature storage conditions. Numerous ways of obtaining improved combinations of lather and mildness have been attempted throughout the years. However further improvements in cleansing compositions are still desired by the consumer.

It has now been found that personal cleansing compositions having improved skin feel and moisturisation attributes, both in use and after use, which deliver excellent lather, cleaning and rinsing attributes in combination with desirable product stability characteristics can be formed by the combination of particular alkyl ethoxy carboxylate surfactants, short chain alkyl sulphate surfactants, auxiliary mild surfactants and, optionally, cationic polymers.

Surprisingly, Applicant has found that the combination of particular alkyl ethoxy carboxylate surfactants and short chain alkyl

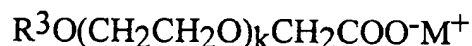
sulphate surfactants with selected mild surfactants is particularly advantageous for the delivery of excellent skin mildness and at the same time providing desirable lathering performance.

It has also been found that the combination of such alkyl ethoxy carboxylate surfactants with short chain alkyl sulphate and nonionic polyhydroxy fatty acid amide surfactants is valuable for the delivery of performance benefits in personal cleansing compositions in terms of improved mildness while maintaining desirable rinsing and lather characteristics.

### Summary Of The Invention

The subject of the present invention is a mild, foam-producing, easily rinsed, cleansing product suitable for personal cleansing of the skin or hair and which may be used, for example, as shower products, skin cleansers, hand, face and body cleansers and shampoos, etc. According to one aspect of the invention, there is provided a personal cleansing composition comprising:

- (a) an alkyl ethoxy carboxylate surfactant of formula I:



wherein  $R^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation  $M$ ;

- (b) a short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) a water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic,

zwitterionic and amphoteric surfactants and mixtures thereof; and

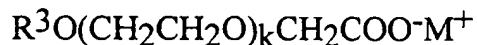
- (d) optionally, a cationic polymeric skin conditioning agent;

wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15% by weight of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and  $1$ ), and wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate is in the range of from about 6:1 to about 1:6.

In a highly preferred embodiment, the invention takes the form of a foam producing liquid personal cleansing composition with superior skin feel and mildness characteristics, excellent rinsing behaviour, improved perceived dryness and expertly graded dryness and skin hydration measurements and trans epidermal water loss (TEWL), combined with excellent lathering, good stability, cleansing ability and conditioning performance. According to a further aspect of the present invention there is provided:

A liquid personal cleansing composition comprising:

- (a) from about 0.1% to about 15 % by weight of alkyl ethoxy carboxylate surfactant of formula I:



wherein  $R^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units ( $k$ ) per mole of fatty alcohol, and a cation  $M$ ;

- (b) from about 0.1% to about 15% by weight of short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) from about 0.01% to about 60% by weight of water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof;
- (d) optionally, from about 0.01% to about 5% by weight of cationic polymeric skin conditioning agent; and
- (e) water.

wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15% by weight of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and  $1$ ), and wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate to is in the range of from about 6:1 to about 1:6.

All concentrations and ratios herein are by weight of the cleansing composition, unless otherwise specified. Surfactant chain lengths are also on a weight average chain length basis, unless otherwise specified.

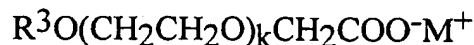
The cleansing compositions herein are based on a combination of alkyl ethoxy carboxylates with other mild surfactants and, optionally polymeric skin conditioning agents. Preferred embodiments also contain perfume or cosmetic oils.

### Detailed Description

#### Alkyl Ethoxy Carboxylate Surfactant

The compositions of the present invention contain, as an essential component an alkyl ethoxy carboxylate surfactant at a level of from about 0.1% to about 15%, preferably from about 0.1% to about 10%, more preferably from about 0.5% to about 6% and especially from about 1% to about 4% by weight. The alkyl ethoxy carboxylate surfactant is particularly valuable in the compositions according to the present invention for the delivery of excellent skin mildness attributes in combination with excellent rinsing performance and desirable lather characteristics.

Alkyl ethoxy carboxylates suitable for use herein have the general formula (I):



wherein  $R^3$  is a straight or branched hydrocarbyl chain, preferably, a  $C_{10}$  to  $C_{15}$  alkyl or alkenyl group, more preferably a  $C_{11}$ - $C_{15}$ , most preferably a  $C_{12}$ - $C_{14}$  alkyl or  $C_{12}$ - $C_{13}$  alkyl group,  $k$  ranges from about 2 to about 7, preferably from about 2.5 to about 6, more preferably from about 3 to about 6.5, even more preferably from about 3.5 to about 5.5, especially from about 4 to about 5, most preferably from about 4 to about 4.5, and  $M$  is a cation, preferably a water-solubilizing cation, preferably an alkali metal, alkaline earth metal, ammonium, lower alkanol ammonium, and mono-, di-, and tri-ethanol ammonium, aminomethyl propanol (available as AMP-95 (RTM) from Angus Chemicals), tetrahydroxypropyl ethylene diamine (available as Neutrol TE (RTM) from BASF) more preferably sodium, potassium and ammonium, most preferably sodium and ammonium and mixtures thereof with magnesium and calcium ions.

It has been found that it is possible to deliver improved mildness characteristics in combination with an excellent lather profile in



personal cleansing compositions which contain particular alkyl ethoxy carboxylate surfactants as defined above.

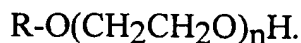
Alkyl sulphate and alkyl ethoxy sulphate surfactants are well known for use in personal cleansing compositions. It is known that alkyl sulphate can deliver excellent lather attributes, but at the expense of mildness. Ethoxylated alkyl sulphate surfactants demonstrate improved mildness, versus alkyl sulphate, but at the expense of lather. The lather performance of ethoxylated alkyl sulphate surfactants decreases with increasing level of ethoxylation. At levels of ethoxylation of greater than about 4, alkyl ethoxy sulphates deliver good mildness results, but poor lather performance.

The delivery of both excellent mildness and good lather performance from the alkyl ethoxy carboxylates of the present invention, having values of  $k$  in the range of from about 2 to about 7, more especially from about 3 to about 6, and particularly from about 4 to about 4.5, and wherein the total level of unethoxylated and singly ethoxylated surfactant (i.e., where  $k = 0$  and 1) is no more than about 15% by weight, is especially surprising, in comparison to the behaviour of alkyl ethoxy sulphate surfactants, where, as the level of ethoxylation is increased the mildness is improved but the lather performance is decreased.

Previous studies on the impact of the degree of ethoxylation ( $k$ ) on the lather and mildness profiles of alkyl ethoxy carboxylate surfactants have found that it is necessary to control the value of  $k$  to minimise the value of  $k$  equal to 0 and  $k$  greater than 7 as well as minimising the levels of alcohol ethoxylate and soap in the product (as illustrated in Patent application WO-A-92/08777, Cripe et al). Applicant has found that while the level of  $k = 0$  does have some effect on the performance of the alkyl ethoxy carboxylate surfactant, combined control of both the  $k = 0$  and  $k = 1$  ethoxylate levels is valuable for further improvements in performance. Furthermore, contrary to the teaching of WO-A-92/08777, it has also been found that restricting the amount of surfactant having  $k = 7$  and greater is not

necessary for the delivery of desirable mildness, rinsing and lather attributes.

The value of  $k$ , as defined herein, can be calculated from analysis of the alkyl ethoxy carboxylate surfactants of the present invention, according to conventional analytical techniques. In the alternative, as value of  $k$ , for a given alkyl ethoxy carboxylate, will generally correlate to the level of ethoxylation for the corresponding fatty alcohol precursor,  $k$  can also be calculated from analysis of the fatty alcohol precursor. Fatty alcohol precursors for the alkyl ethoxy carboxylates of the present invention have the general formula:



wherein,  $n$  represents the number of ethoxylate units on a molar average basis. It is known that fatty alcohol will contain at least some unethoxylated material,  $\text{R-OH}$ , i.e., wherein  $n = 0$ . This unethoxylated alcohol can react in the oxidative process to form fatty acid soap.

If the oxidative process, as preferred for use herein, is used for the manufacture of the alkyl ethoxy carboxylic acid, from the appropriate fatty alcohol precursor, then the value of  $k$  will be approximately equal to  $n$  minus 1 (i.e.,  $k = n - 1$ ). If, in the alternative, an additive process, as defined hereinafter, is used for the manufacture of the alkyl ethoxy carboxylate (for example using sodium mono chloroacetate) the value of  $k$  will be approximately equal to  $n$  (i.e.,  $k = n$ ).

When the alkyl ethoxy carboxylate surfactant according to the present invention does comprise such an ethoxylate distribution ( $k$ ), the preferred ethoxylate distribution ( $k$ ) is such that, on a weight basis (of alkyl ethoxy carboxylic acid), the amount of material where  $k$  is 0 or 1 is less than about 15%, preferably less than about 10%, more preferably less than about 5% by weight. The desired distribution of ethoxy carboxylates ( $k$ ) may be derived by converting an appropriate distribution of ethoxylated alcohol precursors, to ethoxy carboxylates, by methods known in the art and described hereinafter.

The preferred average values of  $k$  are in the range of from about 3 to about 6 when  $R^3$  is a hydrocarbyl chain having an average chain length of from  $C_{11}$  to  $C_{14}$  carbon atoms. Preferred alkyl ethoxy carboxylate surfactants suitable for use herein are the  $C_{12}$  to  $C_{14}$  (EO 3-6) ethoxy carboxylates and the  $C_{12}$  to  $C_{13}$  (EO 3-6) ethoxy carboxylates. Suitable materials include salts of NEODOX 23-4 (TM) available from Shell Inc. (Houston, Texas, USA). Highly preferred for use herein are alkyl ethoxy carboxylate surfactants wherein, when  $R^3$  is a  $C_{12}$ - $C_{14}$  or  $C_{12}$ - $C_{13}$  alkyl group and the average value of  $k$  is in the range of from about 3 to about 6, more preferably from about 3.5 to about 5.5, especially from about 4 to about 5 and most preferably from about 4 to about 4.5.

While not wishing to be bound to any particular theory it is proposed herein that the excellent rinsing and foaming performance of alkyl ethoxy carboxylates having a selected ethoxylate distribution of less than about 15% of  $k$  equal to 0 and 1, (with maintenance of an excellent mildness profile) is related to the minimisation of the interaction between low  $k$  value alkyl ethoxy carboxylate surfactants and cations in the wash water. Applicant has found that re-balancing of the alkyl ethoxy carboxylate surfactant, such that the total level of surfactant with values of  $k = 0$  and 1 is less than about 15%, results in a surfactant that combines both excellent skin mildness attributes with improved lather and clean rinsing characteristics.

Preferred for use in the compositions according to the present invention are alkyl ethoxy carboxylate surfactants having average values of  $R^3$  in the range of from about 12 to about 14 or from about 12 to about 13 and selected values of  $k$ . The preferred values of  $k$  are such that the total level of  $k = 0$  and  $k = 1$  is less than about 15%, preferably less than about 10%, more preferably less than about 5% by weight of alkyl ethoxy carboxylate and the total level of ethoxylate where the value of  $k$  is greater than 7 is less than about 15%, preferably less than about 10%, more preferably less than about 5% by weight of alkyl ethoxy carboxylate.

As discussed hereinbefore, manufacture of the alkyl ethoxy carboxylate surfactants of the present invention, from appropriate fatty alcohol precursors via an oxidative process, can lead to the generation of fatty acid soaps (i.e. material where  $n = 0$ ). Fatty acid soaps are detrimental to both lather and mildness performance in personal cleansing compositions.

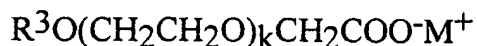
Highly preferred for use herein alkyl ethoxy carboxylate surfactants having average values of  $R^3$  in the range of from about 12 to about 14 or from about 12 to about 13, and selected values of  $k$ , wherein the total level of  $k = 0$  and  $k = 1$  is less than about 15%, preferably less than about 10%, more preferably less than about 5% by weight of alkyl ethoxy carboxylate and wherein the ratio between the total level of fatty acid soap (where  $n = 0$ ) and the total level of  $k = 0$  is from about 2 : 1 to about 1 : 2, preferably from about 1.5 : 1 to about 1 : 1.5, more preferably about 1 : 1, and wherein the total level of  $k = 0$  is greater than 0 and less than about 10% and wherein the total level of ethoxylate where the value of  $k$  is greater than 7 is less than about 15%, preferably less than about 10%, more preferably less than about 10% by weight of alkyl ethoxy carboxylate.

Such narrow range ethoxylates are particularly valuable for the delivery of excellent mildness, lathering and cleaning attributes whilst maintaining the desirable rinsing and stability properties of the compositions according to the present invention.

Thus, according to a further aspect of the present invention there is provided:

A liquid personal cleansing composition comprising:

- (a) from about 0.1% to about 15 % by weight of alkyl ethoxy carboxylate surfactant of formula I:



wherein  $R^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation M;

- (b) from about 0.1% to about 15% by weight of short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) from about 0.01% to about 60% by weight of water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof;
- (d) optionally, from about 0.01% to about 5% by weight of cationic polymeric skin conditioning agent; and
- (e) water

wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15% by weight of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and 1), and wherein  $R^3$  is in the range of from about 12 to about 13 and wherein the total level of ethoxylate where the ratio between the total level of fatty acid soap and the total level of  $k = 0$  is in the range of from about 2 : 1 to about 1 : 2 and wherein the total level of  $k = 0$  is greater than 0 and less than about 10% and wherein the total level of ethoxylate where the value of k is greater than 7 is less than about 15% by weight of alkyl ethoxy carboxylate.

#### Manufacture of alcohol ethoxy surfactants from alcohol precursors

Suitable alcohol precursors of the alkyl ethoxy carboxylates of this invention are primary aliphatic alcohols containing from about 12 to

about 16 carbon atoms. Other suitable primary aliphatic alcohols are the linear primary alcohols obtained from the hydrogenation of vegetable or animal fatty acids such as coconut, palm kernel, and tallow fatty acids or by ethylene build up reactions and subsequent hydrolysis as in the Ziegler type processes. Preferred alcohols are n-octyl, n-nonyl, n-decyl, n-undecyl, n-dodecyl, n-tridecyl, n-tetradecyl, n-pentadecyl, and n-hexadecyl. Other suitable alcohol precursors include primary alcohols having a proportion of branching on the beta or 2-carbon atoms wherein the alkyl branch contains from 1 to 4 carbon atoms. In such alcohols at least 30% of the alcohol of each specific chain is desirably linear and the branching preferably comprises about 50% of methyl groups with smaller amounts of ethyl, propyl and butyl groups. These alcohols are conveniently produced by reaction of linear olefins having from about 11 to 17 carbon atoms with carbon monoxide and hydrogen. Both linear and branched chain alcohols are formed by these processes and the mixtures can either be used as such or can be separated into individual components and then recombined to give the desired blend.

Typical processes for producing "Oxo" halides which are then used to prepare alcohols are disclosed in US-A-2,564,456 and US-A-2,587,858 and the direct hydroformylation of olefins to give alcohols is disclosed in US-A-2,504,682 and US-A-1,581,988.

The equivalent secondary alcohols can also be used. It will be apparent that by using a single chain length olefin as starting material, a corresponding single chain length alcohol will result, but it is generally more economical to utilise mixtures of olefins having a spread of carbon chain length around the desired mean. This will, of course, provide a mixture of alcohols having the same distribution of chain lengths around the mean.

Primary aliphatic alcohols derived from vegetable oils and fats and from other petroleum feed stocks having alkyl or alkylene groups as part of their structure will also contain a range of chain lengths. Since the range of chain lengths is C<sub>8</sub>-C<sub>20</sub> and beyond, it is therefore normal practice to separate the product from such feed stocks into

different chain length ranges which are chosen with reference to their ultimate use.

The desired average ethoxy chain length on the alcohol ethoxylate can be obtained by using a catalysed ethoxylation process, wherein the molar amount of ethylene oxide reacted with each equivalent of fatty alcohol will correspond to the average number of ethoxy groups on the alcohol ethoxylated. The addition of ethylene oxide to alkanols is known to be promoted by a catalyst, most conventionally a catalyst of either strongly acidic or strongly basic character. Suitable basic catalysts are the basic salts of the alkali metals of Group I of the Periodic Table, e.g. sodium, potassium, rubidium, and caesium, and the basic salts of certain of the alkaline earth metals of Group II of the Periodic Table, e.g. calcium, strontium, barium, and in some cases magnesium. Suitable acidic catalysts include, broadly, the Lewis acid Friedel-Crafts catalysts. Specific examples of these catalysts are the fluorides, chlorides, and bromides of boron, antimony, tungsten, iron, nickel, zinc, tin, aluminium, titanium, and molybdenum. The use of complexes of such halides with, for example, alcohols, ethers, carboxylic acids, and amines have also been reported. Still other examples of known acidic alkoxylation catalysts are sulfuric and phosphoric acids; perchloric acid and the perchlorates of magnesium, calcium, manganese, nickel, and zinc; metals oxalates, sulfates, phosphates, carboxylates, and acetates; alkali metal fluoroborates, zinc titanate; and metal salts of benzene sulfonic acid. The type of catalyst used will determine the distribution of the range of ethoxy groups. Stronger catalysts will result in a very tight or narrow distribution of the ethoxy groups around the mean. Weaker catalysts will result in a wider distribution.

The surfactant mixture also contains from 0% to about 10%, preferably less than about 8%, most preferably less than about 5% by weight (of the alkyl ethoxy carboxylic acid), of alcohol ethoxylates of the formula  $\text{RO}(\text{CH}_2\text{CH}_2\text{O})_n\text{H}$  wherein R is a  $\text{C}_{12}$  to  $\text{C}_{16}$  alkyl group and n ranges from 0 to about 10 and the average n is less than 6. The surfactant mixture also contains 0% to about 10%, preferably less than about 8%, most preferably less than about 5% (by weight of the alkyl

ethoxy carboxylic acid), of soaps of the formula  $\text{RCOO-M}^+$  wherein R is a  $\text{C}_{11}$  to  $\text{C}_{15}$  alkyl group and M is a cation as described above.

The uncarboxylated alcohol ethoxylates noted above are a detriment to the alkyl ethoxy carboxylate surfactant mixture. Therefore, it is important that the level of uncarboxylated material be controlled, a level of less than 10% by weight of the alcohol ethoxylates is desirable. Although commercially available alkyl ethoxy carboxylates contain 10% or more of alcohol ethoxylates, there are known routes to obtain the desired high purity alkyl ethoxy carboxylates. For example, unreacted alcohol ethoxylates can be removed by steam distillation, US-A-4,098,818 (Example 1), or by recrystallization of the alkyl ethoxy carboxylate, GB-A-1,027,481 (Example 1). Other routes to the desired carboxylates are the reaction of sodium hydroxide or sodium metal and monochloroacetic acid, or its salt, with alcohol ethoxylates under special pressure and temperature combinations, as described in US-A-3,992,443 and US-A-4,098,818; and JP-A-50-24215.

Alternatively, a hindered base, such as potassium tertbutoxide can replace the sodium hydroxide in the above cited patents, thus yielding high purity alkyl ethoxy carboxylates with less stringent temperature and pressure requirements. Specifically, a hindered base of the formula  $\text{RO-M}^+$ , constituting generally an alkyl group, a reactive oxygen centre, and a cation is used. The structure of this hindered base is secondary or tertiary and contains a non-linear alkyl group with at least one site of branching within 3 carbon atoms of the reactive centre, the oxygen atom, and an alkali metal or alkaline earth metal cation. The process comprises reacting the alcohol ethoxylates with the hindered base described above and either anhydrous chloroacetic acid, at a molar ratio of the hindered base to the anhydrous chloroacetic acid of 2:1, or an alkali metal salt or alkaline earth metal salt of anhydrous chloroacetic acid, at a molar ratio of the hindered base to the alkali metal salt or alkaline earth metal salt of chloroacetic acid of 1:1, wherein the molar ratio of the ethoxylated fatty alcohol to the anhydrous chloroacetic acid or the alkali metal salt of alkaline earth metal salt thereof is from about 1:0.7 to about 1:1.25, the temperature is



from about 20 to 140°C, and the pressure is from about 1 to 760 mm Hg.

Other routes to high purity alkyl ethoxy carboxylates are the reaction of alcohol ethoxylate with oxygen in the presence of platinum, palladium, or other noble metals, as disclosed in US-A-4,223,460 (Example 1-7); US-A-4,214,101 (Example 1); US-A-4,348,509; DE-A-3,446,561; and JP-A-62,198,641. One of the by-products of such reaction is soap, which should be limited, as described above, to avoid adversely affecting the cleaning and mildness advantages provided by the present compositions. This can be accomplished by using alcohol ethoxylate feed stock containing low levels of unethoxylated fatty alcohol and by selecting catalysts that preferentially oxidise the terminal methylene in the alcohol ethoxylate, at least about 90% of the time, preferably at least about 95% of the time. Oxidation of non-terminal methylene groups in the alcohol ethoxylate will generate soap from ethoxylated fatty alcohol components. The level of soap in the product should be no more than about 10%, preferably less than 5%.

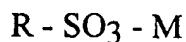
#### Short Chain Alkyl Sulphate Surfactant

The compositions according to the present invention include as a further essential feature a short chain alkyl sulphate surfactant at a level of from about 0.1% to about 15%, preferably from about 1% to about 10%, more preferably from about 2% to about 5% by weight. Short chain alkyl sulphate surfactants in combination with alkyl ethoxy carboxylate surfactants, as defined herein, are valuable in personal cleansing compositions for the delivery of excellent mildness in combination with excellent lather and rinsing characteristics.

'Short chain' as defined herein means an average carbon chain length of C<sub>10</sub> or less. The short chain alkyl sulphate surfactants of the present invention are particularly valuable in personal cleansing compositions for the delivery of improved skin mildness attributes and product rinsing benefits in combination with a desirable lather profile when the ratio of alkyl ethoxy carboxylate surfactant, as defined herein, to short chain alkyl sulphate surfactant is in the range of from about 6 :

1 to about 1 : 6, preferably from about 5 : 1 to about 1 : 5, more preferably from about 3 : 1 to about 1 : 3.

Alkyl sulphate surfactants suitable for inclusion in the compositions of the present invention have the general formula (II);



wherein R is straight or branched chain alkyl, preferably straight chain, containing on average from about 8 to about 10 carbon atoms, preferably about 10 carbon atoms and wherein M is selected from alkali metals, ammonium or other suitable monovalent cation or mixtures thereof. It should be understood that the definition of any particular carbon chain length, say C<sub>8</sub> is an average value and as such may contain certain proportions of both higher and lower carbon chain lengths as a direct function of its synthesis. The level of such material can be achieved by modification of the process and the nature of the starting materials. While C<sub>10</sub> alkyl sulphate is the preferred surfactant in the compositions of the invention mixtures of short chain alkyl sulphates may also be used. Especially preferred in the compositions herein is C<sub>10</sub> alkyl sulphate material containing at least about 80% by weight of the C<sub>10</sub>, preferably at least about 90% C<sub>10</sub>, more preferably at least about 95% C<sub>10</sub> and especially at least about 99% C<sub>10</sub> alkyl sulphate. Suitable short chain alkyl sulphate materials are available from Albright and Wilson under the trade names Empicol LC35 and Empicol 0758F.

#### Auxiliary Surfactant

As a further essential feature the compositions of the present invention comprise a mild surfactant system of water-soluble auxiliary surfactants. Mild surfactants suitable for inclusion in compositions according to the present invention generally have a lipophilic chain length of from about 8 to about 22 carbon atoms and can be selected from anionic, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof. The total level of auxiliary surfactant is preferably from about 2% to about 40%, more preferably from about 3% to about 15%, and especially from about 3% to about 10% by weight. The compositions may comprise a mixture of anionic with zwitterionic

and/or amphoteric surfactants. The level of the individual auxiliary anionic, zwitterionic and amphoteric surfactant components, where present, is in the range from about 1% to about 15%, and especially from about 1% to about 10% by weight of the composition, while the level of nonionic surfactant, where present, is in the range from about 0.1% to about 20% by weight, preferably from about 0.5% to about 16%, more preferably from about 1% to about 12% by weight. The weight ratio of auxiliary anionic surfactant: zwitterionic and/or amphoteric surfactant is in the range from about 1:10 to about 10:1, preferably from about 1:5 to about 5:1, more preferably from about 1:3 to about 3:1. Other suitable compositions within the scope of the invention comprise mixtures of anionic, zwitterionic and/or amphoteric surfactants with one or more nonionic surfactants. Preferred for use herein are soluble or dispersible nonionic surfactants selected from ethoxylated animal and vegetable oils and fats and mixtures thereof, sometimes referred to herein as "oil-derived" nonionic surfactants.

The compositions of the invention can also comprise an auxiliary water-soluble anionic surfactant at levels from about 0.1% to about 20%, more preferably from about 0.1% to about 10%, and especially from about 1% to about 8% by weight.

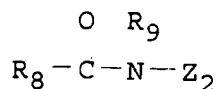
Water soluble auxiliary anionic surfactants suitable for inclusion in the compositions of the invention can generally be described as mild synthetic detergent surfactants and include ethoxylated alkyl sulfates, alkyl glyceryl ether sulfonates, methyl acyl taurates, fatty acyl glycines, N-acyl glutamates, acyl isethionates, alkyl sulfosuccinates, alkyl ethoxysulphosuccinates, alpha-sulfonated fatty acids, their salts and/or their esters, alkyl phosphate esters, ethoxylated alkyl phosphate esters, alkyl sulphates, acyl sarcosinates and fatty acid/protein condensates, and mixtures thereof. Alkyl and/or acyl chain lengths for these surfactants are C<sub>12</sub>-C<sub>22</sub>, preferably C<sub>12</sub>-C<sub>18</sub> more preferably C<sub>12</sub>-C<sub>14</sub>.

Auxiliary water-soluble anionic surfactants suitable for use in the compositions according to the present invention are the salts of sulfuric acid esters of the reaction product of 1 mole of a higher fatty alcohol and from about 1 to about 12 moles of ethylene oxide, with sodium, ammonium and magnesium being the preferred counterions.

Particularly preferred are the alkyl ethoxy sulphates containing from about 2 to 6, preferably 2 to 4 moles of ethylene oxide, such as sodium laureth-2 sulphate, sodium laureth-3 sulphate and magnesium sodium laureth-3.6 sulphate. In preferred embodiments, the anionic surfactant contains at least about 50% especially at least about 75% by weight of ethoxylated alkyl sulphate.

In addition to the broad range ethoxylated alkyl sulphates obtained via conventional sodium catalysed ethoxylation techniques and subsequent sulphonation processes, ethoxylated alkyl sulphates obtained from narrow range ethoxylates (NREs) are also suitable water-soluble auxiliary anionic surfactants for use in the present compositions. Narrow range ethoxylated alkyl sulphates suitable for use herein are selected from sulphonated alkyl ethoxylates containing on average from about 1 to about 6, preferably from about 2 to about 4 and especially about 3 moles of ethylene oxide such as NRE sodium laureth-3 sulphate. NRE materials suitable for use herein contain distributions of the desired ethylene oxide ( $EO_n$ ) in the ranges of from 15% to about 30% by weight of  $EO_n$ , from about 10% to about 20% by weight of  $EO_{n+1}$  and from about 10% to about 20% by weight of  $EO_{n-1}$ . Highly preferred NRE materials contain less than about 9% by weight of ethoxylated alkyl sulphate having 7 or more moles of ethylene oxide and less than about 13% by weight of non-ethoxylated alkyl sulphate. Suitable laureth 3 sulphate NRE materials are available from Hoechst under the trade names GENAPOL ARO Narrow Range and GENAPOL Narrow Range.

The compositions according to the present invention may additionally comprise auxiliary water-soluble nonionic surfactant at levels from about 0.1% to about 20%, more preferably from about 0.1% to about 10%, and especially from about 1% to about 8% by weight. Surfactants of this class include  $C_{12}$ - $C_{18}$  fatty acid mono- and dialkanolamides such as cocoethanolamide, cocomonoisopropylamide, cocodiethanolamide and ethoxylated derivatives thereof, sucrose polyester surfactants and polyhydroxy fatty acid amide surfactants having the general formula (III).



The preferred N-alkyl, N-alkoxy or N-aryloxy, polyhydroxy fatty acid amide surfactants according to formula (III) are those in which R<sub>8</sub> is C<sub>5</sub>-C<sub>31</sub> hydrocarbyl, preferably C<sub>6</sub>-C<sub>19</sub> hydrocarbyl, including straight-chain and branched chain alkyl and alkenyl, or mixtures thereof and R<sub>9</sub> is

typically hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl or hydroxyalkyl, preferably methyl, or a group of formula -R<sup>1</sup>-O-R<sup>2</sup> wherein R<sup>1</sup> is C<sub>2</sub>-C<sub>8</sub> hydrocarbyl including straight-chain, branched-chain and cyclic (including aryl), and is preferably C<sub>2</sub>-C<sub>4</sub> alkylene, R<sup>2</sup> is C<sub>1</sub>-C<sub>8</sub> straight-chain, branched-chain and cyclic hydrocarbyl including aryl and oxyhydrocarbyl, and is preferably C<sub>1</sub>-C<sub>4</sub> alkyl, especially methyl, or phenyl. Z<sub>2</sub> is a polyhydroxyhydrocarbyl moiety having a linear hydrocarbyl chain with at least 2 (in the case of glyceraldehyde) or at least 3 hydroxyls (in the case of other reducing sugars) directly connected to the chain, or an alkoxylated derivative (preferably ethoxylated or propoxylated) thereof. Z<sub>2</sub> preferably will be derived from a reducing sugar in a reductive amination reaction, most preferably Z<sub>2</sub> is a glycityl moiety. Suitable reducing sugars include glucose, fructose, maltose, lactose, galactose, mannose, and xylose, as well as glyceraldehyde. As raw materials, high dextrose corn syrup, high fructose corn syrup, and high maltose corn syrup can be utilised as well as the individual sugars listed above. These corn syrups may yield a mix of sugar components for Z<sub>2</sub>. It should be understood that it is by no means intended to exclude other suitable raw materials. Z<sub>2</sub> preferably will be selected from the group consisting of -CH<sub>2</sub>-(CHOH)<sub>n</sub>-CH<sub>2</sub>OH, -CH(CH<sub>2</sub>OH)-(CHOH)<sub>n-1</sub>-CH<sub>2</sub>H, CH<sub>2</sub>(CHOH)<sub>2</sub>(CHOR')CHOH-CH<sub>2</sub>OH, where n is an integer from 1 to 5, inclusive, and R' is H or a cyclic mono- or poly-saccharide, and alkoxylated derivatives thereof. As noted, most preferred are glycityls wherein n is 4, particularly -CH<sub>2</sub>-(CHOH)<sub>4</sub>-CH<sub>2</sub>OH.

The most preferred polyhydroxy fatty acid amide has the formula R<sub>8</sub>(CO)N(CH<sub>3</sub>)CH<sub>2</sub>(CHOH)<sub>4</sub>CH<sub>2</sub>OH wherein R<sub>8</sub> is a C<sub>6</sub>-C<sub>19</sub> straight chain alkyl or alkenyl group. In compounds of the above formula, R<sub>8</sub>-

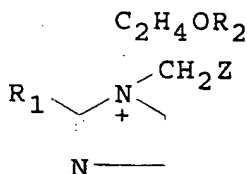
CO-N< can be, for example, cocoamide, stearamide, oleamide, lauramide, myristamide, capricamide, palmiamide, tallowamide, etc.

Preferred for use herein are compositions comprising a mixture of alkyl ethoxy carboxylate surfactant and polyhydroxy fatty acid amide surfactant wherein the ratio of carboxylate to amide surfactant is from about 3 : 1 to about 1 : 3, preferably from about 2 : 1 to about 1 : 2, more preferably from about 1.5 : 1 to about 1 : 1.5 and especially about 1 : 1.

A process for making the above compounds having formula (III) comprises reacting a fatty acid triglyceride or a fatty methyl ester with an N-substituted polyhydroxy amine in the substantial absence of lower (C<sub>1</sub>-C<sub>4</sub>) alcoholic solvent, but preferably with an alkoxylated alcohol or alkoxylated alkyl phenol such as NEODOL and using an alkoxide catalyst at temperatures of from about 50°C to about 140°C to provide high yields (90-98%) of the desired products. Suitable processes for making the desired polyhydroxy fatty acid amide compounds are outlined in US-A-5,194,639 and US-A-5,380,891.

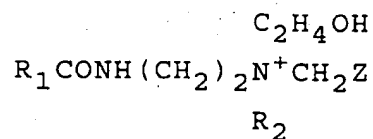
The compositions for use herein may also contain a water-soluble auxiliary amphoteric surfactant at a level of from about 0.1% to about 20%, preferably from about 0.1% to about 10%, more preferably from about 1% to about 8% by weight. Auxiliary amphoteric surfactants suitable for use in the compositions of the invention include:

(a) imidazolinium surfactants of formula (IV)



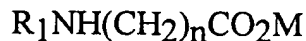
wherein R<sub>1</sub> is C<sub>7</sub>-C<sub>22</sub> alkyl or alkenyl, R<sub>2</sub> is hydrogen or CH<sub>2</sub>Z, each Z is independently CO<sub>2</sub>M or CH<sub>2</sub>CO<sub>2</sub>M, and

M is H, alkali metal, alkaline earth metal, ammonium or alkanolammonium; and/or ammonium derivatives of formula (V)

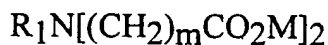


wherein  $\text{R}_1$ ,  $\text{R}_2$  and Z are as defined above;

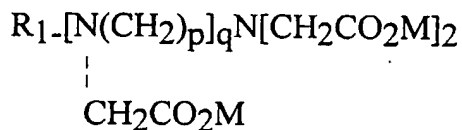
(b) aminoalkanoates of formula (VI)



iminodialkanoates of formula (VII)



and iminopolyalkanoates of formula (VIII)



wherein n, m, p, and q are numbers from 1 to 4, and  $\text{R}_1$  and M are independently selected from the groups specified above; and

(c) mixtures thereof.

Suitable amphoteric surfactants of type (a) are marketed under the trade name Miranol and Empigen and are understood to comprise a complex mixture of species. Traditionally, the Miranols have been described as having the general formula IV, although the CTFA Cosmetic Ingredient Dictionary, 3rd Edition indicates the non-cyclic structure V while the 4th Edition indicates yet another structural isomer in which  $\text{R}_2$  is O-linked rather than N-linked. In practice, a complex

mixture of cyclic and non-cyclic species is likely to exist and both definitions are given here for sake of completeness. Preferred for use herein, however, are the non-cyclic species.

Examples of suitable amphoteric surfactants of type (a) include compounds of formula IV and/or V in which  $R_1$  is  $C_8H_{17}$  (especially iso-capryl),  $C_9H_{19}$  and  $C_{11}H_{23}$  alkyl. Especially preferred are the compounds in which  $R_1$  is  $C_9H_{19}$ , Z is  $CO_2M$  and  $R_2$  is H; the compounds in which  $R_1$  is  $C_{11}H_{23}$ , Z is  $CO_2M$  and  $R_2$  is  $CH_2CO_2M$ ; and the compounds in which  $R_1$  is  $C_{11}H_{23}$ , Z is  $CO_2M$  and  $R_2$  is H.

In CTFA nomenclature, materials suitable for use in the present invention include cocoamphocarboxypropionate, cocoamphocarboxy propionic acid, and especially cocoamphoacetate and cocoamphodiacetate (otherwise referred to as cocoamphocarboxyglycinate). Specific commercial products include those sold under the trade names of Ampholak 7TX (sodium carboxy methyl tallow polypropyl amine), Empigen CDL60 and CDR 60 (Albright & Wilson), Miranol H2M Conc. Miranol C2M Conc. N.P., Miranol C2M Conc. O.P., Miranol C2M SF, Miranol CM Special (Rhône-Poulenc); Alkateric 2CIB (Alkaril Chemicals); Amphoterger W-2 (Lonza, Inc.); Monateric CDX-38, Monateric CSH-32 (Mona Industries); Rewoteric AM-2C (Rewo Chemical Group); and Schercotic MS-2 (Scher Chemicals).

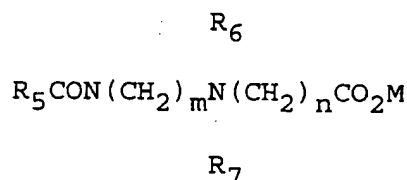
It will be understood that a number of commercially-available amphoteric surfactants of this type are manufactured and sold in the form of electroneutral complexes with, for example, hydroxide counterions or with anionic sulfate or sulfonate surfactants, especially those of the sulfated  $C_8$ - $C_{18}$  alcohol,  $C_8$ - $C_{18}$  ethoxylated alcohol or  $C_8$ - $C_{18}$  acyl glyceride types. Preferred from the viewpoint of mildness and product stability, however, are compositions which are essentially free of (non-ethoxylated) sulfated alcohol surfactants. Note also that the concentrations and weight ratios of the amphoteric surfactants are based herein on the uncomplexed forms of the surfactants, any anionic surfactant counterions being considered as part of the overall anionic surfactant component content.



Examples of preferred amphoteric surfactants of type (b) include N-alkyl polytrimethylene poly-, carboxymethylamines sold under the trade names Ampholak X07 and Ampholak 7CX by Berol Nobel and also salts, especially the triethanolammonium salts and salts of N-lauryl-beta-amino propionic acid and N-lauryl-imino-dipropionic acid. Such materials are sold under the trade name Deriphat by Henkel and Mirataine by Rhône-Poulenc.

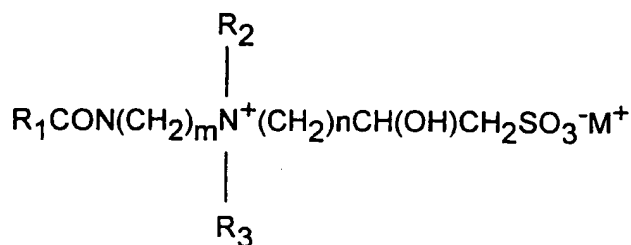
The compositions herein can also contain from about 0.1% to about 20%, more preferably from about 0.1% to about 10%, and especially from about 1% to about 8% of a zwitterionic surfactant.

Water-soluble auxiliary betaine surfactants suitable for inclusion in the compositions of the present invention include alkyl betaines of the formula  $R_5R_6R_7N^+(CH_2)_nCO_2M$  and amido betaines of the formula (IX)



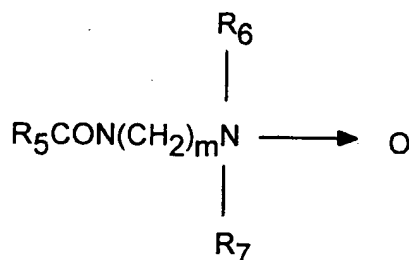
wherein  $R_5$  is  $C_{11}$ - $C_{22}$  alkyl or alkenyl,  $R_6$  and  $R_7$  are independently  $C_1$ - $C_3$  alkyl,  $M$  is H, alkali metal, alkaline earth metal, ammonium or alkanolammonium, and  $n$ ,  $m$  are each numbers from 1 to 4. Preferred betaines include cocoamidopropyldimethylcarboxymethyl betaine, laurylamidopropyldimethylcarboxymethyl betaine and Tego betaine (RTM).

Water-soluble auxiliary sultaine surfactants suitable for inclusion in the compositions of the present invention include alkylamido sultaines of the formula;



wherein  $R_1$  is  $C_7$  to  $C_{22}$  alkyl or alkenyl,  $R_2$  and  $R_3$  are independently  $C_1$  to  $C_3$  alkyl,  $M$  is  $H$ , alkali metal, alkaline earth metal, ammonium or alkanolammonium and  $m$  and  $n$  are numbers from 1 to 4. Preferred for use herein is coco amido propylhydroxy sultaine.

Water-soluble auxiliary amine oxide surfactants suitable for inclusion in the compositions of the present invention include alkyl amine oxide  $R_5R_6R_7NO$  and amido amine oxides of the formula:



wherein  $R_5$  is  $C_{11}$  to  $C_{22}$  alkyl or alkenyl,  $R_6$  and  $R_7$  are independently  $C_1$  to  $C_3$  alkyl,  $M$  is  $H$ , alkali metal, alkaline earth metal, ammonium or alkanolammonium and  $m$  is a number from 1 to 4. Preferred amine oxides include cocoamidopropylamine oxide, lauryl dimethyl amine oxide and myristyl dimethyl amine oxide.

#### Polymeric Cationic Conditioning Agent

The compositions according to the present invention can optionally include a polymeric cationic conditioning agent. Polymeric cationic conditioning agents are valuable in the compositions according to the present invention for provision of desirable skin feel attributes. The polymeric skin conditioning agent is preferably present at a level from about 0.01% to about 5%, preferably from about 0.01% to about 3% and especially from about 0.01% to about 2% by weight.

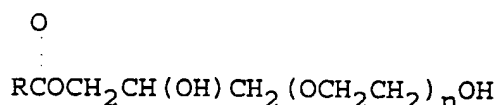
Suitable polymers are high molecular weight materials (mass-average molecular weight determined, for instance, by light scattering, being generally from about 2,000 to about 5,000,000, preferably from

about 5,000 to about 3,000,000 more preferably from 100,000 to about 1,000,000).

Representative classes of polymers include cationic polysaccharides; cationic homopolymers and copolymers derived from acrylic and/or methacrylic acid; cationic cellulose resins; cationic copolymers of dimethyldiallylammonium chloride and acrylamide and or acrylic acid; cationic homopolymers of dimethyldiallylammonium chloride; cationic polyalkylene and ethoxypolyalkylene imines; quaternized silicones, and mixtures thereof.

By way of exemplification, cationic polymers suitable for use herein include cationic guar gums such as hydroxypropyl trimethyl ammonium guar gum (d.s. of from 0.11 to 0.22) available commercially under the trade names Jaguar C-14-S(RTM) and Jaguar C-17(RTM) and also Jaguar C-16(RTM), which contains hydroxypropyl substituents (d.s. of from 0.8-1.1) in addition to the above-specified cationic groups, and quaternized hydroxy ethyl cellulose ethers available commercially under the trade names Ucare Polymer JR-30M, JR-400, Catanal (RTM) and Celquat. Other suitable cationic polymers are homopolymers of dimethyldiallylammonium chloride available commercially under the trade name Merquat 100, copolymers of dimethyl aminoethylmethacrylate and acrylamide, copolymers of dimethyldiallylammonium chloride and acrylamide, available commercially under the trade names Merquat 550 and Merquat S, acrylic acid/dimethyldiallylammonium chloride/acrylamide copolymers available under the trade name Merquat 3330, quaternized vinyl pyrrolidone acrylate or methacrylate copolymers of amino alcohol available commercially under the trade name Gafquat, for example Polyquaternium 11, 23 and 28 (quaternized copolymers of vinyl pyrrolidone and dimethyl aminoethylmethacrylate - Gafquat 755N and co-polymers of vinyl pyrrolidene and dimethylaminoethyl methacrylamide - HS-100), vinyl pyrrolidone/vinyl imidazolium methochloride copolymers available under the trade names Luviquat FC370, Polyquaternium 2, and polyalkyleneimines such as polyethylenimine and ethoxylated polyethylenimine.

The compositions of the invention preferably also contain from about 0.1% to about 20%, preferably from about 1% to about 15%, and more preferably from about 2% to about 10% by weight of an oil derived nonionic surfactant or mixture of oil derived nonionic surfactants. Oil derived nonionic surfactants are valuable in compositions according to the invention for the provision of skin feel benefits both in use and after use. Suitable oil derived nonionic surfactants for use herein include water soluble vegetable and animal-derived emollients such as triglycerides with a polyethyleneglycol chain inserted; ethoxylated mono and di-glycerides, polyethoxylated lanolins and ethoxylated butter derivatives. One preferred class of oil-derived nonionic surfactants for use herein have the general formula (XII)



wherein n is from about 5 to about 200, preferably from about 20 to about 100, more preferably from about 30 to about 85, and wherein R comprises an aliphatic radical having on average from about 5 to 20 carbon atoms, preferably from about 7 to 18 carbon atoms.

Suitable ethoxylated oils and fats of this class include polyethyleneglycol derivatives of glyceryl cocoate, glyceryl caproate, glyceryl caprylate, glyceryl tallowate, glyceryl palmate, glyceryl stearate, glyceryl laurate, glyceryl oleate, glyceryl ricinoleate, and glyceryl fatty esters derived from triglycerides, such as palm oil, almond oil, and corn oil, preferably glyceryl tallowate and glyceryl cocoate.

Suitable oil derived nonionic surfactants of this class are available from Croda Inc. (New York, USA) under their Crovol line of materials such as Crovol EP40 (PEG 20 evening primrose glyceride), Crovol EP 70 (PEG 60 evening primrose glyceride) Crovol A-40 (PEG 20 almond glyceride), Crovol A-70 (PEG 60 almond glyceride), Crovol M-40 (PEG 20 maize glyceride), Crovol M-70 (PEG 60 maize glyceride), Crovol PK-40 (PEG 12 palm kernel glyceride), and Crovol PK-70 (PEG 45 palm kernel glyceride) and under their Solan range of

materials such as Solan E, E50 and X polyethoxylated lanolins and Aqualose L-20 (PEG 24 lanolin alcohol) and Aqualose W15 (PEG 15 lanolin alcohol) available from Westbrook Lanolin. Further suitable surfactants of this class are commercially available from Sherex Chemical Co. (Dublin, Ohio, USA) under their Varonic LI line of surfactants and from Rewo under their Rewoderm line of surfactants. These include, for example, Varonic LI 48 (polyethylene glycol (n=80) glyceryl tallowate, alternatively referred to as PEG 80 glyceryl tallowate), Varonic LI 2 (PEG 28 glyceryl tallowate), Varonic LI 420 (PEG 200 glyceryl tallowate), and Varonic LI 63 and 67 (PEG 30 and PEG 80 glyceryl cocoates), Rewoderm LI5-20 (PEG-200 palmitate), Rewoderm LIS-80 (PEG-200 palmitate with PEG-7 glyceryl cocoate) and Rewoderm LIS-75 (PEG-200 palmitate with PEG-7 glyceryl cocoate) and mixtures thereof. Other oil-derived emollients suitable for use are PEG derivatives of corn, avocado, and babassu oil, as well as Softigen 767 (PEG(6) caprylic/capric glycerides).

Also suitable for use herein are nonionic surfactants derived from composite vegetable fats extracted from the fruit of the Shea Tree (*Butyrospermum Karkii* Kotschy) and derivatives thereof. This vegetable fat, known as Shea Butter is widely used in Central Africa for a variety of means such as soap making and as a barrier cream, it is marketed by Sederma (78610 Le Perray En Yvelines, France). Particularly suitable are ethoxylated derivatives of Shea butter available from Karlshamn Chemical Co. (Columbos, Ohio, USA) under their Lipex range of chemicals, such as Lipex 102 E-75 and Lipex 102 E-3 (ethoxylated mono, di-glycerides of Shea butter) and from Croda Inc. (New York, USA) under their Crovol line of materials such as Crovol SB-70 (ethoxylated mono, di-glycerides of Shea butter). Similarly, ethoxylated derivatives of Mango, Cocoa and Illipe butter may be used in compositions according to the invention. Although these are classified as ethoxylated nonionic surfactants it is understood that a certain proportion may remain as non-ethoxylated vegetable oil or fat.

Other suitable oil-derived nonionic surfactants include ethoxylated derivatives of almond oil, peanut oil, rice bran oil, wheat germ oil, linseed oil, jojoba oil, oil of apricot pits, walnuts, palm nuts,

pistachio nuts, sesame seeds, rapeseed, cade oil, corn oil, peach pit oil, poppyseed oil, pine oil, castor oil, soybean oil, avocado oil, safflower oil, coconut oil, hazelnut oil, olive oil, grapeseed oil, and sunflower seed oil.

Oil derived nonionic surfactants highly preferred for use herein from the viewpoint of optimum mildness and skin feel characteristics are Lipex 102-3 (RTM) (PEG-3 ethoxylated derivatives of Shea Butter) and Softigen 767 (RTM) (PEG-6 caprylic/capric glycerides).

The compositions according to the present invention can also comprise lipophilic emulsifiers as skin care actives. Suitable lipophilic skin care actives include anionic food grade emulsifiers which comprise a di-acid mixed with a monoglyceride such as succinylated monoglycerides, monostearyl citrate, glyceryl monostearate diacetyl tartrate and mixtures thereof.

The compositions of the invention may also include an insoluble perfume or cosmetic oil or wax or a mixture thereof at a level up to about 10%, preferably up to about 3% by weight wherein the oil or wax is insoluble in the sense of being insoluble in the product matrix at a temperature of 25°C. Addition of such oils or waxes can provide emolliency, mildness and rinsibility characteristics to personal cleansing compositions according to the invention. It is a feature of the invention, however, that compositions having excellent emolliency and mildness together with desirable physical attributes (clarity etc.) can be delivered which are essentially oil-free, ie which contain less than about 1%, preferably less than 0.5% by weight of an added oil phase. Physically, preferred compositions of this type take the form of an optically-clear solution or microemulsion. In compositions including an additional perfume or cosmetic oil or wax, preferably the weight ratio of oil-derived nonionic surfactant to added oil is at least about 1:2, more especially at least about 3:1.

Suitable insoluble cosmetic oils and waxes for use herein can be selected from water-insoluble silicones inclusive of non-volatile polyalkyl and polyaryl siloxane gums and fluids, volatile cyclic and

linear polyalkylsiloxanes, polyalkoxylated silicones, amino and quaternary ammonium modified silicones, rigid cross-linked and reinforced silicones and mixtures thereof, C<sub>1</sub>-C<sub>24</sub> esters of C<sub>8</sub>-C<sub>30</sub> fatty acids such as isopropyl myristate, myristyl myristate and cetyl ricinoleate, C<sub>8</sub>-C<sub>30</sub> esters of benzoic acid, beeswax, saturated and unsaturated fatty alcohols such as behenyl alcohol, hydrocarbons such as mineral oils, petrolatum squalane and squalene, polybutene, fatty sorbitan esters (see US-A-3988255, Seiden, issued October 26th 1976), lanolin and oil-like lanolin derivatives, animal and vegetable triglycerides such as almond oil, peanut oil, wheat germ oil, rice bran oil, linseed oil, jojoba oil, oil of apricot pits, walnuts, palm nuts, pistachio nuts, sesame seeds, rapeseed, cade oil, corn oil, peach pit oil, poppyseed oil, pine oil, castor oil, soyabean oil, avocado oil, safflower oil, coconut oil, hazelnut oil, olive oil, grapeseed oil, and sunflower seed oil, and C<sub>1</sub>-C<sub>24</sub> esters of dimer and trimer acids such as diisopropyl dimerate, diisostearylmalate, diisostearyldimerate and triisostearyltrimerate.

Nonionic water-soluble cellulose ethers can be used as additional skin moisturising and thickening agents in the compositions according to the present inventions. Widely used, commercially-available nonionic cellulose ethers include methyl cellulose, hydroxy propyl methyl cellulose, hydroxyethylcellulose, hydroxypropyl cellulose and ethyl hydroxyethyl cellulose. Particularly preferred for use herein are hydrophobically modified hydroxy ethyl cellulose materials.

Highly preferred hydrophobically modified hydroxy ethyl cellulose (HMHEC) polymers suitable for use herein have a 1% aqueous viscosity in the range of from about 8,000 to about 50,000 mPas (Brookfield LVT viscometer, spindle No. 4, speed 4).

Commercially available materials preferred for use herein include NATROSOL PLUS Grade 330 CS (RTM), a hydrophobically modified hydroxyethylcellulose available from Aqualon Company, Wilmington, Delaware. This material has a C<sub>16</sub> alkyl substitution of from 0.4% to 0.8% by weight. The hydroxyethyl molar substitution for this material

is from 3.0 to 3.7. The average molecular weight for the water-soluble cellulose prior to modification is approximately 300,000. Also suitable for use herein is NATROSOL PLUS Grade 430 CS (RTM)

Another material of this type is sold under the trade name NATROSOL PLUS CS Grade D-67 (RTM), by Aqualon Company, Wilmington, Delaware. This material has a C<sub>16</sub> substitution of from 0.50% to 0.95%, by weight. The hydroxyethyl molar substitution for this material is from 2.3 to 3.7. The average molecular weight for the water soluble cellulose prior to modification is approximately 700,000. Highly preferred for use herein are C<sub>14</sub> - C<sub>18</sub> alkyl and alkenyl modified hydroxy ethyl cellulose polymers having a degree of ethoxylation of from about 1.8 to about 3.2, preferably from about 2.0 to about 3.0, more preferably from about 2.2 to about 2.8 and an alkyl and alkenyl substitution level of from about 0.3 to about 0.8, preferably from about 0.4 to about 0.7, most preferably from about 0.5 to about 0.7 and especially about 0.65. Highly preferred are cetyl modified hydroxy ethyl cellulose polymers as available from the Aqualon Co. under the trade names Polysurf 67 (RTM) having a molecular weight of about 700,000.

Also suitable for use herein are nonionic hydrophobically modified ethoxylated urethanes (HEUR). Preferred HEURs suitable for use herein are those sold by Rohm & Haas under Acrysol 44 (RTM), by Berol Nobel under Bermodol 2101 (RTM), 2130 (RTM) and Bermodol Pur 2100 (RTM) and by Servo under the name Ser-Ad-FX-100 (RTM).

Also suitable for use herein are hydrophobically modified polyol (HNP) based nonionic, water-soluble, associative polymers. Suitable HNPs for use herein are fatty acid esters of glucosides such as PEG 120 methyl glucoside dioleate (available from Amercol under the trade name Glucamate DOE 120), PEG-150 pentaerythrityl tetrastearate (available from Croda under the trade name Crothix (RTM)), PEG-75 dioleate (available from Kessco under the trade name PEG-4000 dioleate (RTM)) and PEG-150 distearate (available from Witco under the trade name Witconal L32 (RTM)).



These copolymer materials are valuable for both the delivery of excellent thickening properties and improved lathering characteristics with maintenance of desirable rinse feel attributes.

The present compositions can also comprise a nonionic or anionic polymeric thickening component, especially a water-soluble polymeric materials, having a molecular weight greater than about 20,000. By "water-soluble polymer" is meant that the material will form a substantially clear solution in water at a 1% concentration at 25°C and the material will increase the viscosity of the water. Examples of water-soluble polymers which may desirably be used as an additional thickening component in the present compositions, are hydroxyethylcellulose, hydroxypropyl cellulose, hydroxypropyl methylcellulose, polyethylene glycol, polyacrylamide, polyacrylic acid, polyvinyl alcohol (examples include PVA 217 from Kurary Chemical Co., Japan), polyvinyl pyrrolidone K-120, dextrans, for example Dextran purified crude Grade 2P, available from D&O Chemicals, carboxymethyl cellulose, plant exudates such as acacia, ghatti, and tragacanth, seaweed extracts such as sodium alginate, propylene glycol alginate and sodium carrageenan. Preferred as the additional thickeners for the present compositions are natural polysaccharide materials. Examples of such materials are guar gum, locust bean gum, and xanthan gum. Also suitable herein preferred is hydroxyethyl cellulose having a molecular weight of about 700,000.

Additional polymeric thickening agents include acrylic acid/ethyl acrylate copolymers and the carboxyvinyl polymers sold by the B.F. Goodrich Company under the trade mark of Carbopol resins. These resins consist essentially of a colloiddally water-soluble polyalkenyl polyether crosslinked polymer of acrylic acid crosslinked with from 0.75% to 2.00% of a crosslinking agent such as for example polyallyl sucrose or polyallyl pentaerythritol. Examples include Carbopol 934, Carbopol 940, Carbopol 950, Carbopol 980, Carbopol 951 and Carbopol 981. Carbopol 934 is a water-soluble polymer of acrylic acid crosslinked with about 1% of a polyallyl ether of sucrose having an average of about 5.8 allyl groups for each sucrose molecule. Also suitable for use herein are hydrophobically-modified cross-linked

polymers of acrylic acid having amphipathic properties available under the Trade Name Carbopol 1382, Carbopol 1342 and Pemulen TR-1 (CFTA Designation: Acrylates/10-30 Alkyl Acrylate Crosspolymer). A combination of the polyalkenyl polyether cross-linked acrylic acid polymer and hydrophobically modified cross-linked acrylic acid polymer is also suitable for use herein.

The polymeric thickening component, if present in the compositions of the present invention, is at a level of from 0.1% to 10%, preferably 0.3% to 5.0%, more preferably from 0.4% to 3.0% by weight.

Further thickening agents suitable for use herein include ethylene glycol or polyethylene glycol esters of a fatty acid having from about 16 to about 22 carbon atoms and up to 7 ethyleneoxy units, preferably the ethylene glycol stearates, both mono and distearate, but particularly the distearate containing less than about 7% of the mono stearate, alkanolamides of fatty acids, having from about 16 to about 22 carbon atoms, preferably about 16 to 18 carbon atoms such as stearic monoethanolamide, stearic diethanolamide, stearic monoisopropanolamide and stearic monoethanolamide, alkyl (C<sub>16</sub> - C<sub>22</sub>) dimethyl amine oxides such as stearyl dimethyl amine oxide and electrolytes such as magnesium sulphate and sodium chloride salts. Fatty alcohol or fatty acid materials having from about 12 to about 22 carbon atoms as thickening components are also suitable for use as thickening agents in the compositions of the present invention. Suitable fatty acid and fatty alcohol thickeners include Laurex NC (C<sub>12/14</sub> fatty alcohol) available from Albright and Wilson, or Dobanol 23 (C<sub>12/13</sub> fatty alcohol), Dobanol 25 (C<sub>12</sub>-C<sub>15</sub> fatty alcohol) and Dobanol 45 (C<sub>14/15</sub> fatty alcohol) available from Shell UK Ltd (also available under the Neodol trademark from Shell US Inc.) and Prifac 7908 (palm kernel fatty acid) available from Unichema. Also suitable for use herein as thickening agents are fatty acid esters of glucosides such as PEG 120 methyl glucoside dioleate (available from Amercol under the trade name Glucamate DOE 120). The additional thickening agent, if present, is at a level of from 0.1% to 10%, preferably from 0.3% to 5.0% by weight.

The viscosity of the final composition (Brookfield DV-II, 1 rpm with Cone CP41 or CP52, 25°C, neat) is preferably at least about 500 cps, more preferably from about 500 to about 50,000 cps, especially from about 1,000 to about 30,000 cps, more especially from about 2,000 to about 15,000 cps.

The cleansing compositions can optionally include other hair or skin moisturizers which are soluble in the cleansing composition matrix. The preferred level of such moisturizers is from about 0.5% to about 20% by weight. In preferred embodiments, the moisturizer is selected from essential amino acid compounds found naturally occurring in the stratum corneum of the skin and water-soluble nonpolyol nonocclusives and mixtures thereof.

Some examples of more preferred nonocclusive moisturizers are polybutene, squalane, sodium pyrrolidone carboxylic acid, D-panthenol, lactic acid, L-proline, guanidine, pyrrolidone, hydrolyzed protein and other collagen-derived proteins, aloe vera gel, acetamide MEA and lactamide MEA and mixtures thereof.

Compositions according to the present invention may also include an opacifier or pearlescent agent. Such materials may be included at a level of from about 0.01% to about 5%, preferably from about 0.2% to about 1.3% by weight. A suitable opacifier for inclusion in the present compositions is a polystyrene dispersion available under the trade names Lytron 621 & 631 (RTM) from Morton International.

Additional opacifiers/pearlescers suitable for inclusion in the compositions of the present invention include: titanium dioxide, TiO<sub>2</sub>; EUPERLAN 810 (RTM); TEGO-PEARL (RTM) and mixtures thereof.

In preferred compositions the opacifier/pearlescer is present in the form of crystals. In highly preferred compositions the opacifier/pearlescer is a particulate polystyrene dispersion having a particle size of from about 0.05 microns to about 0.45 microns, preferably from about 0.17 microns to about 0.3 microns, such

dispersions being preferred from the viewpoint of providing optimum rheology and shear-thinning behaviour. Highly preferred is styrene PVP copolymer and Lyton 631 (RTM).

A number of additional optional materials can be added to the cleansing compositions each at a level of from about 0.1% to about 2% by weight. Such materials include proteins and polypeptides and derivatives thereof; water-soluble or solubilizable preservatives such as DMDM Hydantoin, Germall 115, methyl, ethyl, propyl and butyl esters of hydroxybenzoic acid, EDTA, Euxyl (RTM) K400, natural preservatives such as benzyl alcohol, potassium sorbate and bisababol; sodium benzoate and 2-phenoxyethanol; other moisturizing agents such as hyaluronic acid, chitin, and starch-grafted sodium polyacrylates such as Sanwet (RTM) IM-1000, IM-1500 and IM-2500 available from Celanese Superabsorbent Materials, Portsmouth, VA, USA and described in US-A-4,076,663; solvents; suitable anti-bacterial agents such as Oxeco (phenoxy isopropanol), Trichlorocarbanide and Triclosan and; low temperature phase modifiers such as ammonium ion sources (e.g.  $\text{NH}_4\text{Cl}$ ); viscosity control agents such as magnesium sulfate and other electrolytes; colouring agents;  $\text{TiO}_2$  and  $\text{TiO}_2$ -coated mica; perfumes and perfume solubilizers; and zeolites such as Valfour BV400 and derivatives thereof and  $\text{Ca}^{2+}/\text{Mg}^{2+}$  sequestrants such as polycarboxylates, amino polycarboxylates, polyphosphonates, amino polyphosphonates, EDTA etc, water softening agents such as sodium citrate and insoluble particulates such as zinc stearate and fumed silica. Water is also present at a level preferably of from about 20% to about 93.99%, preferably from about 40% to about 90%, more preferably at least about 75% by weight of the compositions herein.

The pH of the compositions is preferably from about 4 to about 10, more preferably from about 6 to about 9, especially from about 5 to about 8 and most preferably from about 5 to 7.5.

The invention is illustrated by the following non-limiting examples. In the examples, all concentrations are on a 100% active basis and the abbreviations have the following designation:

Amphoteric 1	Sodium carboxymethyltallow polypropyl amine (Ampholak 7TX from Albright and Wilson)
Amphoteric 2	Cocoamidopropyl hydroxy sultaine
Anionic 1	Sodium C <sub>12</sub> -C <sub>13</sub> Pareth-5-carboxylate (Na salt of carboxylic acid NEODOX 23-4 from Shell US Inc.)
Anionic 2	NaC <sub>10</sub> AS (Empicol LC35 from Albright and Wilson)
Nonionic	Lipex 102-3 (RTM) - PEG-3 ethoxylated shea butter
GA	Polyhydroxy fatty acid amide of formula IX in which R <sub>8</sub> is C <sub>11</sub> -C <sub>17</sub> alkyl, R <sub>9</sub> is methyl, and Z <sub>2</sub> is CH <sub>2</sub> (CHOH) <sub>4</sub> CH <sub>2</sub> OH
Betaine	Cocoamidopropyl dimethyl carboxymethyl betaine.
Polymer 1	Polymer JR-400(RTM) - hydroxyethylcellulose reacted with epichlorohydrin and quaternized with trimethylamine, m.wt. 4 x 10 <sup>6</sup>
Polymer 2	Gafquat 755N(RTM) - quaternized copolymer of vinyl pyrrolidone and di methyl aminoethylmethacrylate
Pearlescer	Ethyleneglycoldistearate/emulsifier mixture
Softigen 767	PEG(6) caprylic/capric glycerides
Thickener 1	Acrysol 44(RTM) - hydrophobically modified urethane from Rohm and Haas
Thickener 2	Glucamate DOE (RTM) - PEG 120 methyl glucoside dioleate from Amercol

Examples I to XIII

The following are personal cleansing compositions in the form of shower gel or bath foam products and which are representative of the present invention:

	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>VII</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>	<u>XI</u>	<u>XII</u>
Anionic 1	3.0	1.0	5.0	5.0	4.0	4.0	3.0	0.5	6.0	6.0	5.0	5.0
Anionic 2	4.0	4.0	1.0	2.0	2.0	3.0	3.0	6.0	4.0	5.0	1.0	2.0
Amphoteric 1	-	3.0	3.0	-	1.0	-	3.0	-	4.0	1.0	2.0	2.0
Amphoteric 2	-	-	-	3.0	-	-	1.0	2.0	-	-	-	-
Betaine	5.0	-	-	-	-	3.0	3.0	5.0	4.0	3.0	-	-
GA	-	5.0	-	3.0	-	-	-	-	-	3.0	3.0	5.0
Nonionic	-	-	-	-	-	1.0	1.0	-	-	1.0	-	1.0
Polymer 1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	0.1	0.1
Polymer 2	0.1	-	-	-	-	0.1	0.1	-	-	-	-	-
Softigen 767	-	-	-	-	-	1.0	-	0.1	-	1.0	-	1.0
Thickener 1	-	-	-	-	-	0.5	-	-	-	-	0.5	-
Thickener 2	-	-	-	1.0	-	-	0.5	0.5	0.5	-	-	0.5
Water	----- to 100 -----											

Compositions I to XII can be prepared by firstly dispersing the water-soluble or colloiddally water-soluble polymeric thickener (where present) in water at 25 °C either in a Tri-blender (RTM) or by extended stirring and hydration. The mixture can then be heated to about 50°C (and above) to enhance dispersion efficiency. The alkyl ethoxy

carboxylate (pre-neutralised as discussed below) and auxiliary surfactants and other skin care agents can then be added along with the remaining water-soluble, oil-insoluble ingredients. The polymeric dispersion is then added to the ambient temperature mix and finally the remaining water, preservative, opacifier and perfume are added.

It is preferable in the compositions according to the present invention to utilise salts of alkyl ethoxy carboxylic acids. A preferred means for the neutralisation of alkyl ethoxy carboxylic acid is, firstly to form a slurry of the acid (at an active level of below 30%) in water, using high shear mixing to preclude formation of a gel phase, followed by careful addition of base to generate the desired alkyl ethoxy carboxylate salt.

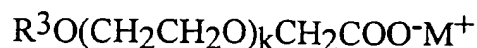
The compositions have a viscosity (Brookfield DVII, 1 rpm with Cone CP41 or CP52, 25°C, neat) in the range of from 500 to 50,000 cps, preferably from 1,000 to 20,000 cps.

The products provide excellent in-use and efficacy benefits including excellent rinsibility, mildness, skin conditioning, skin moisturising, good product stability, cleansing and lathering.

What is claimed is:

1. A personal cleansing composition comprising:

(a) an alkyl ethoxy carboxylate surfactant of formula I:



wherein  $R^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation  $M$ ;

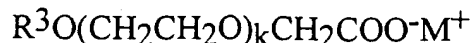
- (b) a short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) a water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof; and
- (d) optionally, a cationic polymeric skin conditioning agent;

wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15% by weight of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and  $1$ ), and wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate is in the range of from about 6:1 to about 1:6.

2. A personal cleansing composition according to Claim 1 in the form of a liquid comprising:



- (a) from about 0.1% to about 15 % by weight of alkyl ethoxy carboxylate surfactant of formula I:



wherein  $R^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2 to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation  $M$ ;

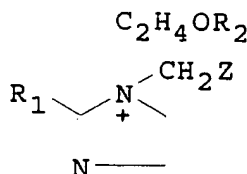
- (b) from about 0.1% to about 15% by weight of short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) from about 0.01% to about 60% by weight of water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof;
- (d) optionally, from about 0.01% to about 5% by weight of cationic polymeric skin conditioning agent; and
- (e) water.

wherein the alkyl ethoxy carboxylate surfactant (a) contains a total of no more than about 15% by weight of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and  $1$ ), and wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate to is in the range of from about 6:1 to about 1:6.

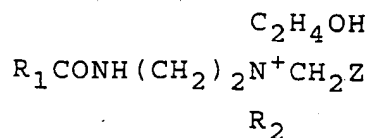
3. A composition according to Claim 1 or 2 wherein the alkyl ethoxy carboxylate surfactant is present at a level of from about 0.1% to about 10%, preferably from about 0.5% to about 6% and more preferably from about 1% to about 4% by weight.

4. A composition according to any of Claims 1 to 3 wherein the combined level of unethoxylated and singly ethoxylated surfactant ( $k = 0$  and 1) is less than 10%, preferably less than 5% by weight of alkyl ethoxy carboxylic.
5. A composition according to any of Claims 1 to 4 wherein the value of  $k$  is from about 3 to about 6, preferably from about 3.5 to about 5.5, more preferably from about 4 to about 4.5.
6. A composition according to any of Claims 1 to 5 wherein the carbon chain  $R^3$  is selected from  $C_{12}$ - $C_{13}$  and  $C_{12}$ - $C_{14}$  and mixtures thereof.
7. A composition according to any of Claims 1 to 6 wherein the short chain alkyl sulphate surfactant is present at a level of from about 1% to about 10%, preferably from about 2% to about 5% by weight.
8. A composition according to any of Claims 1 to 7 wherein the ratio of alkyl ethoxy carboxylate to short chain alkyl sulphate surfactant is in the range of from about 5 : 1 to about 1 : 5, preferably from about 3 : 1 to about 1 : 3.
9. A composition according to any of Claims 1 to 8 wherein the short chain alkyl sulphate is  $C_{10}$  alkyl sulphate.
10. A composition according to any of Claims 1 to 9 wherein the composition has a viscosity (Brookfield DV-II, 1 rpm with Cone CP41 or CP52, 25°C, neat) in the range from 500 to 50,000 cps.
11. A composition according to any of Claims 1 to 10 wherein the total level of auxiliary surfactant is from about 0.1% to about 40%, preferably from about 1% to about 15%, more preferably from about 2% to about 10% by weight.

12. A composition according to any of Claims 1 to 11 wherein the water-soluble auxiliary anionic surfactant is selected from ethoxylated alkyl sulfates, alkyl glyceryl ether sulfonates, methyl acyl taurates, fatty acyl glycinate, N-acyl glutamates, acyl isethionates, alkyl sulfosuccinates, alkyl ethoxy sulphosuccinates, alpha-sulfonated fatty acids, their salts and/or their esters, alkyl phosphate esters, ethoxylated alkyl phosphate esters, acyl sarcosinates and fatty acid/protein condensates, and mixtures thereof.
13. A composition according to any of Claims 1 to 12 wherein the water-soluble auxiliary anionic surfactant is an ethoxylated alkyl sulphate.
14. A composition according to any of Claims 1 to 13 which additionally comprises from about 0.1% to about 20% by weight of a water-soluble auxiliary nonionic surfactant selected from C<sub>12</sub>-C<sub>18</sub> fatty acid mono- and di-ethanolamides, such as cocoethanolamide, cocomonoisopropylamide, cocodiethanolamide and ethoxylated derivatives thereof, sucrose polyester surfactants and polyhydroxy fatty acid amide surfactants.
15. A composition according to any of Claims 1 to 13 wherein the water-soluble auxiliary amphoteric surfactant is selected from:
  - (a) imidazolinium derivatives of formula [IV]

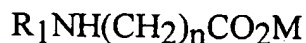


wherein R<sub>1</sub> is C<sub>7</sub>-C<sub>22</sub> alkyl or alkenyl, R<sub>2</sub> is hydrogen or CH<sub>2</sub>Z, each Z is independently CO<sub>2</sub> or CH<sub>2</sub>CO<sub>2</sub>M, and M is H, alkali metal, alkaline earth metal, ammonium or alkanolammonium; and/or ammonium derivatives of formula [V]

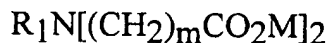


wherein  $R_1$ ,  $R_2$  and  $Z$  are as defined above:

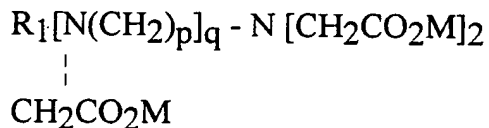
(b) aminoalkanoates of formula [VI]



iminodialkanoates of formula [VII]



and iminopolyalkanoates of formula (VIII)



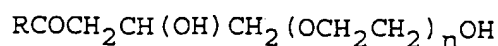
wherein  $n$ ,  $m$ ,  $p$ , and  $q$  are numbers from 1 to 4, and  $R_1$  and  $M$  are independently selected from the groups specified above; and

(c) mixtures thereof.

16. A composition according to Claim 15 wherein the amphoteric is selected from imidazolinium derivatives of formula IV and/or ammonium derivatives of formula V.
17. A composition according to any of Claims 1 to 16 wherein the level of auxiliary amphoteric surfactant is from about 0.1% to about 20%, preferably from about 0.1% to about 10%, more preferably from about 1% to about 8% by weight.

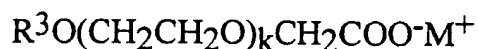
18. A composition according to any of Claims 1 to 17 wherein the water-soluble auxiliary zwitterionic surfactant is selected from alkyl betaine, amido betaine, alkylamido sultaine and mixtures thereof.
19. A composition according to any of the Claims 1 to 18 wherein the level of water-soluble auxiliary zwitterionic surfactant is from about 0.1% to about 20%, preferably from about 0.1% to about 10%, more preferably from about 1% to about 8% by weight..
20. A composition according to any of Claims 1 to 19 wherein the polymeric cationic conditioning agent has a mass average molecular weight in the range from about 2000 to about 5,000,000 preferably between about 5000 to about 3,000,000.
21. A composition according to any of Claims 1 to 20 wherein the polymeric cationic conditioning agent is selected from cationic polysaccharides; cationic homopolymers and copolymers derived from acrylic and/or methacrylic acid; cationic cellulose resins; cationic copolymers of dimethyldiallylammonium chloride and acrylic acid; cationic homopolymers of dimethyldiallylammonium chloride; cationic polyalkylene and ethoxypolyalkylene imines; quaternized silicones, terpolymers of dimethyldiallylammonium chloride / acrylic acid / acrylamide, vinyl pyrrolidone, dimethylamine methacrylate and mixtures thereof.
22. A composition according to any of Claims 1 to 21 wherein the polymeric cationic conditioning agent is present at a level of from about 0.05% to about 4%, preferably from about 0.1% to about 2% and especially from about 0.5% to about 1.5% by weight.
23. A composition according to any of Claims 1 to 22 comprising from about 0.1% to about 20% by weight of nonionic surfactant selected from ethoxylated oils or fats having the formula (XII)

O



wherein n is from about 5 to 200, preferably from about 20 to about 100, more preferably from about 30 to about 85, and wherein R comprises an aliphatic radical having an average from about 5 to 20 carbon atoms, preferably from about 9 to 20 atoms, more preferably from about 11 to 18 carbon atoms, most preferably from about 12 to 16 carbon atoms.

24. A composition according to any of Claims 1 to 23 additionally comprising up to about 20% by weight of perfume or cosmetic oil.
25. A composition according to any of Claims 1 to 24 additionally comprising moisturiser selected from sodium pyrrolidone carboxylic acid, L-proline and mixtures thereof.
26. A composition according to any of Claims 1 to 25 wherein the level of alcohol ethoxylates of the formula  $\text{RO}(\text{CH}_2\text{CH}_2\text{O})_n\text{H}$  is from 0 to about 10% by weight of the alkyl ethoxy carboxylate.
27. A composition according to any of Claims 1 to 26 wherein the level of soap in the surfactant mixture is from 0 to about 10% by weight of the alkyl ethoxy carboxylate.
28. A personal cleansing composition comprising:
  - (a) from about 0.1% to about 15 % by weight of alkyl ethoxy carboxylate surfactant of formula I:



wherein  $\text{R}^3$  is a hydrocarbyl chain having an average carbon chain length of from about 10 to about 15 carbon atoms, and having a molar average number of from about 2

to about 7 ethylene oxide units (k) per mole of fatty alcohol, and a cation M;

- (b) from about 0.1% to about 15% by weight of short chain alkyl sulphate surfactant having an average carbon chain length of from about 8 to about 10 carbon atoms on the alkyl chain;
- (c) from about 0.01% to about 60% by weight of water-soluble auxiliary surfactant, other than the alkyl ethoxy carboxylate of (a) or the short chain alkyl sulphate of (b), selected from anionic surfactant, nonionic, zwitterionic and amphoteric surfactants and mixtures thereof;
- (d) optionally, from about 0.01% to about 5% by weight of cationic polymeric skin conditioning agent; and

wherein the alkyl ethoxy carboxylate surfactant (a) contains a

total of no more than about 15% by weight of unethoxylated

and singly ethoxylated surfactant ( $k = 0$  and 1), and wherein

$R^3$  is in the range of from about 12 to about 13 and wherein

the total level of ethoxylate where the ratio between the total

level of fatty acid soap and the total level of  $k = 0$  is in the range of from about 2 : 1 to about 1 : 2 and wherein the total

level of  $k = 0$  is greater than 0 and less than about 10% and wherein the total level of ethoxylate where the value of  $k$  is greater than 7 is less than about 15% by weight of alkyl ethoxy carboxylate.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US97/11678

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : C11D 1/06, 1/14

US CL : 510/127, 130, 427, 492, 506

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 510/127, 130, 427, 492, 506

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: alkyl sulfate or sulphate, alkyl ethoxy carboxylate

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 5,599,400 A (MAO ET AL) 04 February 1997, column 1, lines 39-49; column 2, lines 5-10, 26-29 and 58-67; column 3, lines 1-6.	1-3, 28
X,P	US 5,545,352 A (PIKE) 13 August 1996, column 6, lines 38-60, column 7, lines 6-7 and 30-50.	1-3, 28
X	US 5,230,823 A (WISE ET AL) 27 July 1993, column 2, lines 31-34, lines 38-68; column 7, lines 1-3 and 21-25; column 15, lines 14-35, column 15, lines 6-26 and 56-60.	1-3, 28
A,P	US 5,534,196 A (CHAPMAN ET AL) 09 July 1996.	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

28 AUGUST 1997

Date of mailing of the international search report

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Name and mailing address of the ISA/US  
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/11678

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 4-27  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.